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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/648,953	08/26/2003	Sean S. Kang	LAMIP177/P1139	4068
22434	7590	01/17/2007	EXAMINER	
BEYER WEAVER LLP			MALDONADO, JULIO J	
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			ART UNIT	PAPER NUMBER
			2823	
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		01/17/2007	PAPER	

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period of reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/648,953

Applicant(s)

KANG ET AL.

Examiner

Julio J. Maldonado

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 October 2006.
2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-12,14-17,21-27,29-36,38 and 39 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☒ Claim(s) 21-23,25-27,31,34-36,38 and 39 is/are allowed.
6) ☒ Claim(s) 1,3-12,14-17,24,29,30,32 and 33 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 20061222.

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date, _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The rejection of claims 1, 3-12, 14-17, 29, 30, 32 and 33 is withdrawn in view of the applicants' amendment filed 07/25/2006.
2. Claims 1-12, 14-17, 21-27, 29-36, 38 and 39 are pending in the application.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1 and 3-12, 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Giammarco et al. (U.S. 4,871,630, hereinafter Giammarco) in view of the following comments.

Giammarco (Figs. 1-5) teaches a method for forming a feature in a layer (30) including the steps of forming a photoresist layer (14) over the layer (30); patterning the photoresist layer (14) to form photoresist features with photoresist sidewalls, where the photoresist features have a first critical dimension; depositing a conformal layer (24) over the sidewalls of the photoresist features to reduce the critical dimensions of the photoresist (14), wherein said conformal layer (24) is made of either silicon dioxide, silicon nitride, silicon oxynitride or a combination thereof by a plasma deposition process and forms substantially vertical sidewalls and uniform thickness; etching features (32) into the layer (30), wherein the layer features have a second critical

dimension, which is less than the first critical dimension; and removing the photoresist layer in a single ashing step (Giammarco, column 2, line 66 – column 6, line 5).

Giammarco fails to expressly disclose wherein forming the conformal layer further comprises a first deposition with a first gas chemistry to form a first deposition plasma comprising providing a flow of the first deposition gas from a first deposition gas source; and stopping the flow of the first deposition gas; and a second deposition with a second gas chemistry to form a second deposition plasma after the flow of the first deposition gas is stopped comprising providing a low of the second deposition gas from a second deposition gas source, wherein the first gas chemistry is different than the second gas chemistry; and stopping the flow of the second deposition gas; and a further third and fourth deposition plasma. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to stop the flow of source gas to make the first layer and start the flow when the second layer is desired to be formed because no gas flow is necessary when there is no deposition taking place and to allow transport to another reactor or intermediate storage to achieve the formation of the conformal layer made of the combination of materials disclosed by Giammarco.

Giammarco substantially teaches all aspects of the invention but fails to expressly disclose wherein the second critical dimension is not greater than 70% of the first critical dimension, wherein the photoresist layer is formed from 248 nm photoresist and the feature has a critical dimension not greater than 140 nm. One of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization to obtain a desired conformal layer with a desired

thickness that would provide said desired critical dimension and a desired photoresist layer. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

5. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yang (U.S. 5,296,410) in view of Moslehi (U.S. 5,273,609).

Yang (Figs.4-7) teaches a method of forming conductive lines including placing a conductive layer (20) over a substrate (10, 12); forming a mask (30), wherein the mask (30) defines a plurality of mask lines with mask spaces between the mask lines, wherein the mask spaces have a width and wherein the mask lines have a width and have sidewalls; placing the substrate (10,12) in a plasma processing chamber; depositing a conformal layer (50) over the sidewalls of the mask (30), while the substrate (10, 12) is in the plasma processing chamber; and etching the conductive layer (20) through the mask (30) to form conductive lines (38) and spaces between the conductive lines (38) (Yang, column 3, line 54 – column 4, line 35).

Yang fails to disclose depositing the conformal layer and etching said substrate in said plasma processing chamber. However, Moslehi (Fig.1) teaches a process to manufacture semiconductor devices including a plasma in situ processing chamber capable of thin film deposition and etching (column 7, line 60 – column 8, line 9).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Yang and Moslehi to enable depositing the conformal layer and etching of the conductive layer of Yang in the processing chamber according to Moslehi, for the further advantage of reducing the processing time involved during gas processing cycles (Moslehi, column 4, lines 56 – 60).

The combined teachings of Yang and Moslehi fail to disclose wherein the widths of the conductive lines is greater than the widths of the line masks, wherein the widths of the mask spaces is more than 50% greater than the widths of the spaces between the conductive lines. One of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization to obtain the desired width. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears *prima facie* that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are *prima facie* obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert.

denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

6. Claims 29, 30, 32 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Giammarco ('630) as applied to claims 1 and 3-12, 14-17 above, and further in view of Moslehi ('609).

Giammarco substantially teaches all aspects of the invention but fails to disclose depositing the conformal layer, etching said layer and ashing the photoresist layer in the same plasma processing chamber. However, Moslehi (Fig.1) teaches a process to manufacture semiconductor devices including a plasma in situ processing chamber capable of thin film deposition and etching (column 7, line 60 – column 8, line 9).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Giammarco and Moslehi to enable depositing the conformal layer and etching of the conductive layer of Giammarco in the processing chamber according to Moslehi, for the further advantage of reducing the processing time involved during gas processing cycles (Moslehi, column 4, lines 56 – 60).

Allowable Subject Matter

7. Claims 21-23, 25-27, 31, 34, 35, 36, 38 and 39 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record fails to teach wherein the depositing the conformal layer provides a portion of the bottom of the via without deposited conformal layer as recited in claims 21-23, 25-27, 31 and 34; and wherein the first and second deposition are

selected from the group of a bread-loading depositing and a faceting depositing, and wherein the first deposition is different from the second deposition as recited in claims 38 and 39.

Response to Arguments

8. Applicant's arguments filed 10/23/2006 have been fully considered but they are not persuasive.

Applicants argue, "...The Examiner rejected Claim 24 under 35 U.S.C. 103(a) as being unpatentable over Yang (US 5,296,410) in view of Moslehi (US 5,273,609). The Examiner stated that Yang and Moslehi fail to teach wherein the widths of the conductive lines are greater than the widths of the line masks, wherein the widths of the mask spaces is more than 50% greater than the widths of the spaces between the conductive lines, but that such features would be obvious in view of the cited references. It is not obvious that it would be possible to successfully reduce the mask spaces by more than 50%. MPEP 706.02(j) states that to establish a prima facie case of obviousness three basic criteria must be met. The second criteria is a reasonable expectation of success. The Examiner failed to show this...". In response to this argument, as stated hereinabove, One of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization to obtain the desired width. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious

absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. Applicants are encouraged, where appropriate, to check Patent Application Information Retrieval (PAIR) (<http://portal.uspto.gov/external/portal/pair>) which provides

applicants direct secure access to their own patent application status information, as well as to general patent information publicly available.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Julio J. Maldonado whose telephone number is (571) 272-1864. The examiner can normally be reached on Monday through Friday.

12. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith, can be reached on (571) 272-1907. The fax number for this group is 571-273-8300. Updates can be found at <http://www.uspto.gov/web/info/2800.htm>.



Julio J. Maldonado
January 5, 2007

Julio J. Maldonado
Patent Examiner
Art Unit 2823



GEORGE R. FOURSON
PRIMARY EXAMINER